ERA HELICOPTERS, INC.

GULF COAST DIVISION
LAKE CHARLES, LOUISIANA

PROCESS SPECIFICATION

PROCESS SPECIFICATION NUMBER: ERA-1018

412 Auxiliary Fuel Tanks

FABRICATION AND INSTALLATION OF THE TANK ATTACHMENT LUGS

PREPARED BY: John E. Stanley DATE: 4/24/87
John E. Stanley
MESH PLASTICS LTD.

APPROVALS

MANUFACTURING	QUALITY CONTROL	ENGINEERING	
Donald B. Pearson	John E. Stanley	Gerald P. Eve	MESH
Billy R. Parker	David K. Murphy	Jack Kelly	ERA

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Scope: This specification outlines the requirements for fabricating and installing the tank attachment lugs for the 412 Auxiliary Fuel Tanks.

Conformation: This specification does not conform to any existing government specification.

Subcontractors: MESH PLASTICS, LTD. of Lake Charles, Louisiana, or its subcontractor shall be the only subcontractors qualified to construct the FRP requirements and shall comply with this process specification. Any deviations or variations are to be submitted to ERA for approval with proper documentation prior to fabrication.

Conflicts: In the event of a conflict with engineering drawing(s) and this specification, the drawing(s) shall govern.

Fabrication and installation
of the Tank Attachment Lugs for
the 412 Auxiliary Fuel Tanks

Rev	Date	Pages	Approvals: Manufacturing MESH	Manufacturing ERA	Quality Control MESH	Quality Control ERA	Engineering MESH	Engineering ERA
IR	4/24/87	ALL	D.B.P.	BRR				
A	5/11/87	Re-issue 5 & 7						
B	1/13/92	3,7						

MATERIALS

MATERIAL	NAME	MANUFACTURER
Resin	Derakane 8084	Dow Chemical Midland, MI
Promoter	Cobalt Napthenate	AKZO Chemie New Brunswick, NJ
Accelerator	Dimethylaniline	Buffalo Colors West Paterson, NJ
MEKP Catalyst	Hi Point 90	Witco Chemical Richmond, CA
	Lupersol DHD 9	Lucidol Chemical Buffalo, NY
Mold Release	PVA	Rexco Carpenteria, CA
	Cerea Mold Release Wax	Ceara Products,Inc. Denver, CO
UV Inhibitor	UV-9	Industrial Chemicals Atlanta, GA

DATE	ENGINEERING ORDER	E.O. No.	SHT.
6/26/95		C-1	1 OF 1
BY: T. Harville	TITLE: PROCESS SPECIFICATION	DWG. AFFECTED: 1018	
APPROVED BY: T. Edwards		ENTERED ON COMPUTER BY: DATE:	

REASON FOR CHANGE: ADD ALT P/N FOR 3/4 & 1 1/2 oz TYPE "E" GLASS MAT (M127)

3/4 oz TYPE "E" GLASS MAT.	M113-3/4 oz	CERTAINTEED WICHITA FALLS, TX.
	OR	
	M127-3/4 oz	CERTAINTEED WICHITA FALLS, TX.
1 1/2 oz TYPE "E" GLASS MAT.	M113-1 1/2 oz	CERTAINTEED WICHITA FALLS, TX.
	OR	
	M127-1 1/2 oz	CERTAINTEED WICHITA FALLS, TX.

MATERIALS

MATERIAL	NAME	MANUFACTURER
Putty filler (Amorphous Fumed Silica)	Aerosil	Dequssa Corp. Teterboro, NJ
	Cabosil	Cabot Corp. Boston, MA
Milled Fiber	731 ED	Owens-Corning Anderson, SC
3/4 oz. Type 'E' glass mat	M113 - 3/4 oz.	Certainteed Wichita Falls, TX
1 1/2 oz. Type 'E' glass mat	Compatamat -1-1/2 oz.	PPG Industries Shelby, NC
	M113 - 1-1/2 oz.	Certainteed Wichita Falls, TX
8.9 oz. Type "ECDE" glass	7781	Burlington Fibers Altavista, VA

MATERIALS

MATERIAL	NAME	MANUFACTURER
Paraffinated Styrene	TF-100	Industrial Chemicals Atlanta, GA
Grinding Discs	36 Grit Type D 60 Grit Type C 80 Grit Type C	3M Corp. St. Paul, MN
Gel Coat	Gel Coat	Co Plas Inc. Ft. Smith, Ark.

A. FABRICATION

NOTE: STEPS 1 & 2 APPLY TO BOTH A & B MOLDS

1) Inspect molds for defects (ie. chips, cracks, crazing, etc. ...). DO Not proceed until any defect is corrected.

2) Apply mold release agent(s) according to manufacturer's instructions to molds.

NOTE: STEPS 3 THROUGH 15 APPLY TO MOLD A ONLY

3) Apply gel coat containing UV inhibitor to mold using a spray gun to a nominal thickness of 10 mils, minimum thickness 6 mils. Allow to cure until tack free.

4) Apply one layer of 3/4 oz. type E glass mat on the mold surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

5) Apply one layer of ECDE Glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

6) Apply second layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

7) Apply second layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

8) Apply third layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

9) Apply third layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

10) Apply fourth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

11) Apply fourth layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

12) Apply fifth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

13) Apply fifth layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

A. FABRICATION - CONT.

14) Apply sixth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

15) Allow to cure for 4 to 6 hours. Separate from mold and trim rough edges.

NOTE: STEPS 16 THROUGH 27 APPLY ONLY TO MOLD B.

16) Apply one layer of 3/4 oz. type E glass mat on the mold surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

17) Set part from Mold A into wet mat making sure alignment is correct. Allow to harden.

NOTE: STEPS 18 THROUGH 27 ARE TO BE APPLIED TO BOTH SIDES OF THE PART.

18) Fill any voids around base with putty.

19) Apply one layer of 3/4 oz. type E glass mat extending approximately 3" onto part. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

20) Apply one layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

21) Apply second layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

22) Apply second layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

23) Apply third layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

24) Apply third layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

25) Apply fourth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

A. FABRICATION - CONT.

26) Apply fourth layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

27) Apply fifth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

28) Apply fifth layer of ECDE glass. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

29) Apply sixth layer of 3/4 oz. type E glass mat. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

30) Additional layers of 1 1/2 oz. type E glass mat may be added to each outside lug face to provide a nominal dimension of .38 for each side of the lug.

31) Separate from the mold and trim to size.

32) Drill and install stainless steel bushings in accordance with Process Specification ERA-1013.

B. INSTALLATION

1) Sand the area on the tank and lug where bonding will occur using 36 grit paper on a grinding disc.

2) Check for proper alignment and fit. The back of the part may be sanded if necessary for proper fit.

3) Apply one layer of 1 1/2 oz. type E glass mat to the area on the tank where bonding will occur. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

4) Apply second layer of 1 1/2 oz. type E glass mat over the first layer. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deareate with serrated rollers.

5) Align lug into position using tooling jig. Allow to harden.

6) Dress down any excess layup protruding out from the lugs.

7) Apply one layer of 3/4 oz. type E glass mat extending approximately 1 1/2" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

8) Apply second layer of 3/4 oz. type E glass mat extending approximately 1 1/2" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

9) Apply third layer of 3/4 oz. type E glass mat extending approximately 1 1/4" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

10) Apply fourth layer of 3/4 oz. type E glass mat extending approximately 1 1/4" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

11) Apply fifth layer of 3/4 oz. type E glass mat extending approximately 1" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

12) Apply sixth layer of 3/4 oz. type E glass mat extending approximately 1" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

B. INSTALLATION - CONT.

13) Apply seventh layer of 3/4 oz. type E glass mat extending approximately 3/4" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

14) Apply eighth layer of 3/4 oz. type E glass mat extending approximately 3/4" onto the tank surface. Saturate completely with Derakane 8084 resin containing UV inhibitor. Deaerate with serrated rollers.

15) Dress down any roughness. Final finishing will by in accordance with Process Specification 1012.

INSPECTION

It is the purpose of the inspection to verify that each part has been fabricated in accordance with and meets the requirements of this specification.

RESPONSIBILITIES: It is the responsibility of the fabricator to make available to ERA Helicopter or his authorized representative any or all of the following:

Records: Records pertaining to the part(s) being purchased shall be supplied when requested. These may include:

- Materials specifications
- Equipment drawings or mold jig
- Materials test results.
- Dimensional verification reports.
- Rework and repair reports.

MATERIALS:

Raw materials used for laminates shall be virgin materials and shall be free of contaminants as described in pgs. 11, 12, 13, 14, 15, and 16.

FABRICATED PARTS: The part to be inspected shall be properly located and positioned, and shall be in condition to permit safe and thorough inspection. Reasonable means shall be provided to permit the inspector to visually examine the entire inner and outer surfaces of the part.

Allowable defects are listed on pgs. 9 and 10.

The following inspection tools and equipment shall be made available for use by the inspector.

- Barcol hardness tester.
- Acetone squeeze bottle with acetone.
- Extension cord with ground fault switch.
- A vapor tight inspection light.
- Thickness gauge.

INSPECTION

TEST OF FINISHED PARTS:

The following basic tests shall be included as a minimum in the Acceptance Inspection.

Barcol Hardness Test - A test of resin cure shall be made in accordance with ASTM D2583. Take 10 readings, discard highest and lowest, average the remaining readings. Minimum acceptable average reading is 30.

Surface Cure Test - An acetone test shall be used to detect surface inhibition on surfaces exposed to air during cure. The procedure that shall be used is the following: rub a few drops of acetone on the surface and check for tackiness after the acetone has evaporated. Persistent tackiness indicates incomplete cure.

Dimensions - The inspector shall be provided with copies of all approved drawings or mold jigs.

OTHER APPLICABLE DOCUMENTS:

ASTM Standards

C 581-74-Test Method for Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures.

D 638-77a-Test method for Tensile Properties of Plastics.

D 790-71-Test Methods for Flexural Properties of Plastics and Electrical Insulating Materials.

D 883-78a-Definitions of Terms Relating to Plastics.

D 2583-75-Test Method for Identation Hardness of Rigid Plastics by Means of a Barcol Impressor.

ALLOWABLE DEFECTS

Defect	Surface inspected
Cracks (through part)	None
Crazing (fine surface cracks)	Max dimension 1/2 in., max density 5 per sq. ft. min 2 in apart
Blisters(rounded elevations of the laminate surface over bubbles)	Max 1/4 in., dia x 1/8 in. high, max 1 per sq ft, min 2 in apart
Wrinkles and solid blisters	Max deviation, 20% of wall thickness but not exceeding 1/8 in.
Pits(craters in the laminate surface)	Max dimensions, 1/8 in dia x 1/16 in deep, max density 10 per sq. ft.
Surface porosity(pin-holes or pores in the laminate)	Max dimensions, 1/16 in dia x 1/16 in deep, max density 10 per sq. ft.
Chips	Max dimension of break, 1/4 in, and thickness no greater than 20 percent of wall thickness, max density 1 per sq ft
Dry spot(nonwetted reinforcing)	Max dimension, 2 sq in. per sq ft
Entrapped air (bubbles or voids in the laminate)	1/8 in. max dia, 4 per sq in. max density; 1/16 in. max dia. 10 per sq in. max density

ALLOWABLE DEFECTS

Defect	Surface inspected
Exposed Glass	None
Burned Areas	None
Exposure of cut edges	None
Scratches	Max length 1 in. max depth 0.010 in.
Foreign Matter	1/16 in.dia, max density 1 per sq ft

FIBERGLASS SURFACING MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass surfacing mat used by the fabricator.

2.0 Definitions

2.1 Fiberglass Surfacing Mat - A random arrangement of glass fibers bonded with a binder to form a thin porous mat which is supplied in roll form. Surfacing mat is usually used to reinforce the corrosion resistant resin rich liner on the inside of equipment and to provide a smooth surface on the exterior of equipment.

2.2 Binder - Chemical treatment applied to the jackstraw arrangement of glass fibers to give the mat integrity. Specific binders are utilized to promote chemical compatibility with the various laminating resins used.

2.3 Slugs - Unfiberized beads of glass.

3.0 Requirements

3.1 Visual Requirements - Each roll of fiberglass surfacing mat shall be inspected to insure it is consistent in color, texture and appearance. Any holes, cuts or visual irregularities shall be removed from the mat prior to or during fabrication.

3.1.1 Slugs - Mat which contains more than four slugs per 100 lineal feet is rejectable.

3.1.2 Wrinkles - Crosswise wrinkles or waves that are visible at a 45 deg. angle and lengthwise wrinkles that can be readily flattened under pressure and that do not crease or change the dimensions of the mat are acceptable.

3.1.3 Wet Spots and Bar Marks - The mat shall be free from these defects.

3.1.4 Delamination - The mat shall not delaminate, i.e. shall not separate into layers in coming off the roll.

FIBERGLASS SURFACING MAT

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS CHOPPED STRAND MAT

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize fiberglass chopped strand mat used by the fabricator.

2.0 Definitions

2.1 Chopped Strand Mat - Chopped strand mat is made from randomly oriented glass strands which are held together in mat form using a binder. Each strand contains a sizing.

3.0 Requirements

3.1 Visual Requirements - Each roll of chopped strand mat shall be inspected to insure it is consistent in color, texture and appearance. It shall be free from surface irregularities, fluffy masses, dirt spots or other foreign material; water spots, knots, binder spots larger than 2" in diameter, clumps of strands and tears of holes which may result form removal of defects.

3.2 Physical Requirements

3.2.1 Weight - The square foot weight of the mat shall be measured for each carton of mat used. All specimens shall fall within the range specified for the product.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the mat unusable.

3.3.1 The mat shall be packaged in an unbroken carton as shipped from the mat manufacturer's factory. The mat used shall not be repackaged in the distribution of the mat after the manufacturer has shipped the mat.

FIBERGLASS CHOPPED STRAND MAT

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number

FIBERGLASS ECDE GLASS

1.0 Scope

1.1 The scope of these procedures is to describe the visual, physical and mechanical parameters which characterize ECDE glass used by the fabricator.

2.0 Definitions

2.1 Fiberglass ECDE glass - Glass fiber rovings woven into a heavy weight fabric.

2.2 Wrap Ends - The rovings which run in the longitudinal direction of the fabric, i.e., along the roll length of the fabric.

2.3 Fill Picks - The rovings which run in the transverse direction of the fabric, i.e., across the roll length of the fabric.

2.4 Leno Strands - A pair of warp ends at each edge of the woven fabric. One Leno warp end is always over each fill pick while the other Leno warp end is always under the fill pick. The Leno strands define the edges of the woven field and serve to stabilize the edges of the fabric.

3.0 Requirements

3.1 Visual Requirements

3.1.1 Dirt Spots - Defined as all foreign matter, dirt, grease spots, etc. - The average number of dirt spots (1/16" to 3/4" in diameter) per 100 lineal feet shall be 6 or less. All rolls shall be free of dirt spots in excess of 3/4" diameter.

3.1.2 Warp Ends - All rolls shall be free of missing warp ends for more than two consecutive feet.

3.1.3 Fill Picks - All rolls shall be free of consecutive missing picks in excess of five, or more than eleven missing picks, either individual picks or any combination of individual and multiple (2, 3, 4, or 5) picks, in any consecutive 100 lineal feet.

3.1.4 Fuzz Clumps and Loops - The product is designed to exhibit proper laydown and shall be free of fuzz clumps or loops exceeding one inch in height from the surface.

FIBERGLASS ECDE GLASS

3.2 Physical Properties

3.2.1 Thickness - The thickness of the mat in each roll of ECDE glass shall be measured.

3.3 Packaging Requirement - Packaging shall be visually inspected to assure proper labeling and that the package is free from damage that may render the ECDE glass unusable.

3.3.1 The ECDE glass shall be packaged in an unbroken carton as shipped from the manufacturer's factory. The ECDE glass used shall not be repackaged in the distribution of the ECDE glass after the manufacturer has shipped the ECDE glass.

3.4 Documentation - It is the responsibility of the fabricator to maintain records showing the results of all material testing. This information shall show at a minimum, the following:

(a) Form of material
(b) Manufacturer
(c) Manufacturer's product description including binder type (treatment)
(d) Manufacturer's product code
(e) Production date, if available, or production code on carton.
(f) Property measured and value recorded

* Visual inspection
* Width
* Thickness
* Packaging

(g) Job number (Internal Fabricator Control Number)

(h) Fabricated part identification number